Eight new species of triggerplant (*Stylidium*: Stylidiaceae) from northern Australia

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Abstract

Lowrie, A. and Kenneally, K.F. Eight new species of triggerplant (*Stylidium*: Stylidiaceae) from northern Australia. Nuytsia 11(2): 199-217 (1997). Eight new *Stylidium* species, *S. adenophorum, S. barrettorum, S. clarksonii, S. mucronatum, S. perizostera, S. prophyllum, S. rivulosum* and *S. turbinatum* Lowrie & Kenneally, are described and illustrated.

Introduction

Three of the new species of triggerplant (*Stylidium*: Stylidiaceae) from northern Australia, *Stylidium adenophorum, S. mucronatum* and *S. turbinatum,* have been treated by previous authors as variants of/or *S. floodii* F. Muell. Following the leptotypification of *S. floodii* (Lowrie & Kenneally 1994), further study has established that the three new species here described are morphologically distinct. Another new species, *S. rivulosum,* also shows superficial morphological similarities to the *S. floodii* complex.

Of the remaining four new species, *S. barrettorum, S. perizostera* and *S. prophyllum* are only known from the Kimberley, north-west Australia, while the fourth species, *S. clarksonii* is known only from north Queensland. Two of these Kimberley species are currently listed as priority flora for conservation.

Taxonomy

Stylidium adenophorum Lowrie & Kenneally, *sp. nov.* (Figure 1)

A *S. floodii* folio prope apicem pilis glandularibus 1-3 ornatis, corolla appendicibus faucis 4, duobus aliformibus 1.2 mm longis, duobus tumoriformibus statim dignoscendo.

Typus: Mount Barnett Roadhouse picnic grounds, Kimberley; Western Australia, 16° 45' S, 125° 56' E, 11 June 1995, *A. Lowrie* 1227 (*holo:* PERTH 04452542; *iso*: DNA, MEL).

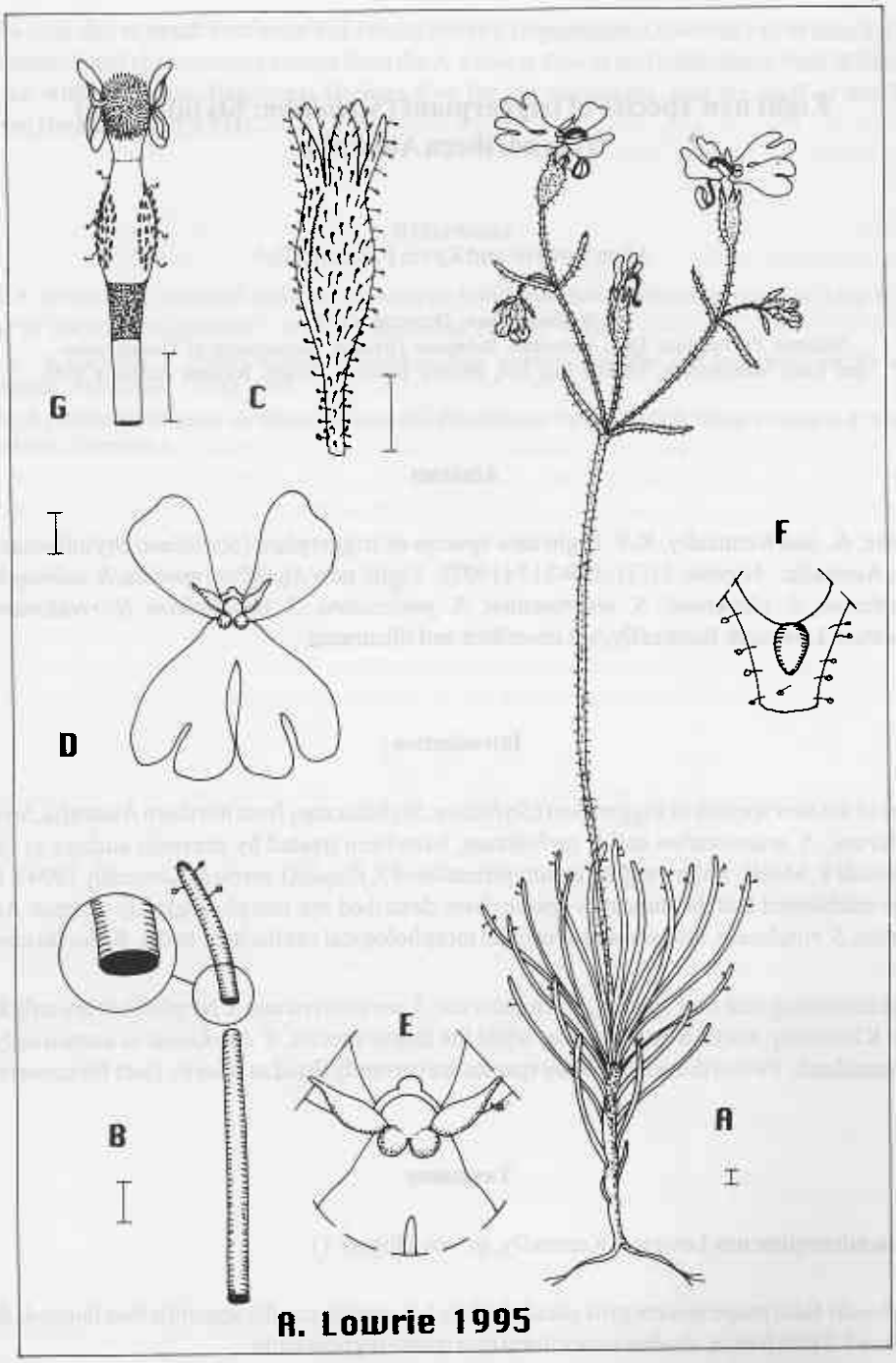

Figure 1. *Stylidium adenophorum* A - habit of flowering plant; B - leaf of basal tuft, enlarged section upper left; C - hypanthium and sepals; D - corolla; E - enlarged section of the corolla showing throat appendages; F - enlarged section of the corolla tube showing labellum on sinus; G - adaxial view of gynostemium column and stigma showing hinged portion (dotted) immediately below stigma, the dilated cunabulum with marginal papillae and the sensitive torosus (stippled). Scale bar for all = 1 mm.

Erect *annual herb* 5-25 cm (mostly 5-15 cm) high, with a glabrous stem 1-3 cm long, lower leaves scattered and often caducous, upper leaves in a terminal tuft. *Leaves* terete, 8-30 mm long, *c.* 0.6 mm diameter, bearing a few glands near the apex, often with additional glands scattered along the leaf, rarely glabrous. *Inflorescence* racemose, scape glandular-hairy. *Bracts* subulate, 1.5-3 mm long, sparsely glandular-hairy; pedicels slender, 3-10 mm (mostly 6 mm) long, glandular-hairy. *Hypanthium* ellipsoid, 1.5-1.8 mm long, *c.* 1 mm diam. at anthesis, glandular-hairy. *Sepals* 5, all free to the base, subulate, 1.5-2 mm long, glandular-hairy. *Corolla* dark pink, lobes vertically paired, abaxial surface a little glandular; anterior lobes obovate, the apex entire or emarginate, *c.* 3.5 mm long, *c.* 1.5 mm wide; posterior lobes obovate, apex deeply 2-lobed to emarginate, *c.* 4.5 mm long, *c.* 2.8 mm wide. *Throat appendages* 4, dark pink; upper pair lanceolate, wing-like, *c.* 1.2 mm long; lower pair small, round, bump-like. *Labellum* attached to the base of the corolla tube sinus, ovate, *c.* 0.7 mm long, *c.* 0.4 mm wide. *Gynostemium* *c.* 5.7 mm long, hinged below the anthers, with a dilated cunabulum bearing 2 crowded marginal rows of short, non-glandular projections above the sensitive torosus, abaxial surface sparsely glandular-hairy. *Capsule* obovoid, 2.5-3 m long. *Seeds* pale orange, *c.* 0.2 mm long.

Other specimens examined. NORTHERN TERRITORY: Towards Churchills Head by 0.5 km on old road, *c.* 80 km N of Tennant Creek, 18° 58' S, 134° 07' E, 10 July 1993, *D.E. Murfet* 1808 (PERTH); Edith Falls Loop Walk, 14° 10' S, 132° 11' E, 19 June 1993, *D.E. Murfet* 1799 (PERTH); Caranbirini Waterhole area S of Borroloola, 16° 16' 30" S, 136° 04' 57" E, 11 May 1996, *D.E. Murfet* 2421 (PERTH).
QUEENSLAND: 24 km S of Wakooka Outstation, Cook district, 14° 45' 13" S, 144° 30' 50" E, 28 May 1993, *V.J. Nelder* 4050 (DNA, K, MBA, MEL, NSW, PERTH); 36.3 km from Dixie Station on the track to Killarney, Cape York, Cook District, 15° 20' S, 143° 27' E, 5 June 1989, *J.R. Clarkson* 8153 & *V.J. Nelder* (MBA, PERTH).
WESTERN AUSTRALIA: On road to Ord Dam, 13.3 km SW of Victoria Highway, Kununurra, 16° 01' S, 128° 51' E, 27 June 1993, *A. Lowrie* 778 (PERTH); Matchbox Creek, on road to Ord Dam, 19.9 km SW of Victoria Highway, Kununurra, 16° 02' S, 128° 47' E, 27 June 1993, *A. Lowrie* 781 (PERTH); On road to Grevillea Gorge, *c.* 20 km N.W. of Beverley Springs, 16° 36' S, 125° 36' E, 6 June 1995, *A. Lowrie* 1183 (PERTH); *c.* 50 km N of Merry Creek crossing on road to Bachsten Creek, Mount Elizabeth Station, 12 June 1995, *A. Lowrie* 1252 (PERTH); 14 km W of Kununurra on Victoria Highway, 15° 46' S, 128° 36' E, 19 June 1995, *A. Lowrie* 1323 (PERTH); Little Mertens Creek, *c.* 0.5 km W of 14° 49' 10" S, 125° 43' 08" E, 28 Apr. 1996, *A. Lowrie* 1408 (PERTH); *c.* 1 km W of Little Mertens Creek on walk trail to Mitchell Falls, *c.* 1.8 km W of 14° 49' 10" S, 125° 43' 08" E, 28 Apr. 1996, *A. Lowrie* 1412 (PERTH).

Distribution. Occurs in northern parts of the Kimberley in Western Australia. Known from the Katherine, Tennant Creek and Boroloola regions in Northern Territory and the Cook district, Cape York region in north Queensland.

Habitat. Grows in grey sands on flat plains in north Queensland; sandy plains bordering creek margins and on watershed areas in Western Australia and Northern Territory.

Flowering period. April-July.

Conservation status. A common species in the Kimberley and not under threat. The conservation status of this species in Northern Territory and Queensland is not known.

Etymology. The specific epithet *adenophorum* is from the Greek *adenos* - gland and *phorus* -bearing, in reference to the glands found on the leaves.

Affinities. The nearest relative to *Stylidium adenophorum* is *S. floodii* F. Muell. *S. adenophorum* is distinguished from *S. floodii* (in parentheses) by having terete leaves bearing a few glands near the apex, often with additional glands scattered along the leaf (leaves linear, acuminate, glabrous); corolla throat appendages 4, upper pair lanceolate and wing-like, lower pair round and bump-like (throat appendages 5, crown-like); labellum *c.* 0.7 mm long, glabrous (labellum *c.* 0.4 mm long, glandular-hairy on margins and apex); gynostemium column *c.* 5.7 mm long, hinged below the anthers, with a dilated cunabulum bearing 2 crowded marignal rows of short, non-glandular projections above the sensitive torosus (gynostemium column strap-like *c.* 5 mm long, narrowing towards the anthers from the sensitive torosus).

Notes. The outline shape of the corolla lobes of this species is commonly variable even within the same population. The anterior lobes range from narrowly to broadly obovate with the apex of lobes entire, emarginate or deeply 2-lobed.

The degree of glandular cover to the leaf is also variable. In the western Kimberley, at least 1 to 3 glands are commonly present on some of the leaves on any given specimen. In the eastern Kimberley near Kununurra the degree of glandular cover to the leaves is greater. Specimens examined from Tennant Creek in the Northern Territory and the Cook district in Queensland show an even greater degree of glandular covering to the leaves.

Stylidium barrettorum Lowrie & Kenneally, *sp. nov.* (Figure 2)

S. leptorrhizo F. Muell. affini sed foliis glabris et appendicibus binatis faucis alatis ornatis differt.

Typus: Grevillea Creek, Beverley Springs Station, Western Australia, 16° 29' S, 125° 21' E 31 May 1992, *Mathew D. Barrett* 4 (*holo*: PERTH 04452666; *iso*: DNA, MEL).

Annual herb to 8-25 cm high. *Leaves* in a basal rosette, oblanceolate, basal portion petiolate, apex with acute point but not sharp, flat in section, margins with an extremely fine white hyaline, 1.5-6 cm long, 4-8 mm wide, glabrous. *Inflorescence* racemose, scape glandular. *Bracts* 1.5-4 mm long, glandular. *Hypanthium* narrowly obovoid, 1.5-2.5 mm long, *c.* 1.2 mm diam. at anthesis, glandular. *Sepals* ovate, 5 free to the base, 1-1.5 mm long. *Corolla* predominantly magenta, lobes vertically paired, abaxial surface mottled red and cream, glandular; anterior lobes broadly obovate, *c.* 4 mm long, *c.* 2.5 mm wide; posterior lobes fused for half to two-thirds of their length, together cuneate in outline, *c.* 5 mm long, *c.* 3 mm wide. *Throat* white, striped pink; throat appendages 2, wing-like, opposite. *Labellum* attached to the base of the corolla tube sinus, ovate, *c.* 0.8 mm long, *c.* 0.4 mm wide. *Gynostemium* narrowly strap-like, *c.* 9.5 mm long, hinged below the anthers, with a dilated cunabulum bearing marginal rows of raised projections above the sensitive torosus, abaxial surface of this section glandular. *Capsule* obovoid, glandular, *c.* 3.5 mm long. *Seeds* orange, *c.* 0.2 mm long.

Other specimens examined. WESTERN AUSTRALIA: Victoria Highway, 2.3 km NW of the Ord Dam turnoff, SE of Kununurra, 15° 57' S, 128° 57' E, 16 June 1993, *A. Lowrie* 715 (PERTH); Gibb River road, Dawn Creek crossing, 15° 59' S, 127° 02' E, 18 June 1993, *A. Lowrie* 720 (PERTH); King Edward River crossing, 15° 07' S, 126° 43' E, 18 June 1993, *A. Lowrie* 724 (PERTH); On walk trail from Mertens Creek camp site to Mitchell Falls before the first rainforest thicket, Mitchell Plateau, 20 June 1993, *A. Lowrie* 730 (PERTH); King Edward River crossing, 15° 07' S, 126° 43' E, 24 June 1993, *A. Lowrie* 767 (PERTH); Unamon Creek on road to Pago Mission, 14° 06' S, 126° 43' E, 26 June 1994, *A. Lowrie* 1021 (PERTH); On the margins of creek near Pago Mission ruins, 14° 08' S, 126° 43' E, 26 June 1994, *A. Lowrie* 1027 (PERTH); Camping ground just W of King Edward River crossing, 14° 52' 57" S, 126° 12' 09" E, 25 Sep. 1995, *A. Lowrie* 1337 (PERTH); Peter Lacy's camp, tributary of Bachsten Creek, 15° 59' 21" S, 125° 19' 46" E, 31 July 1996, *A. Lowrie* 1510 (PERTH).

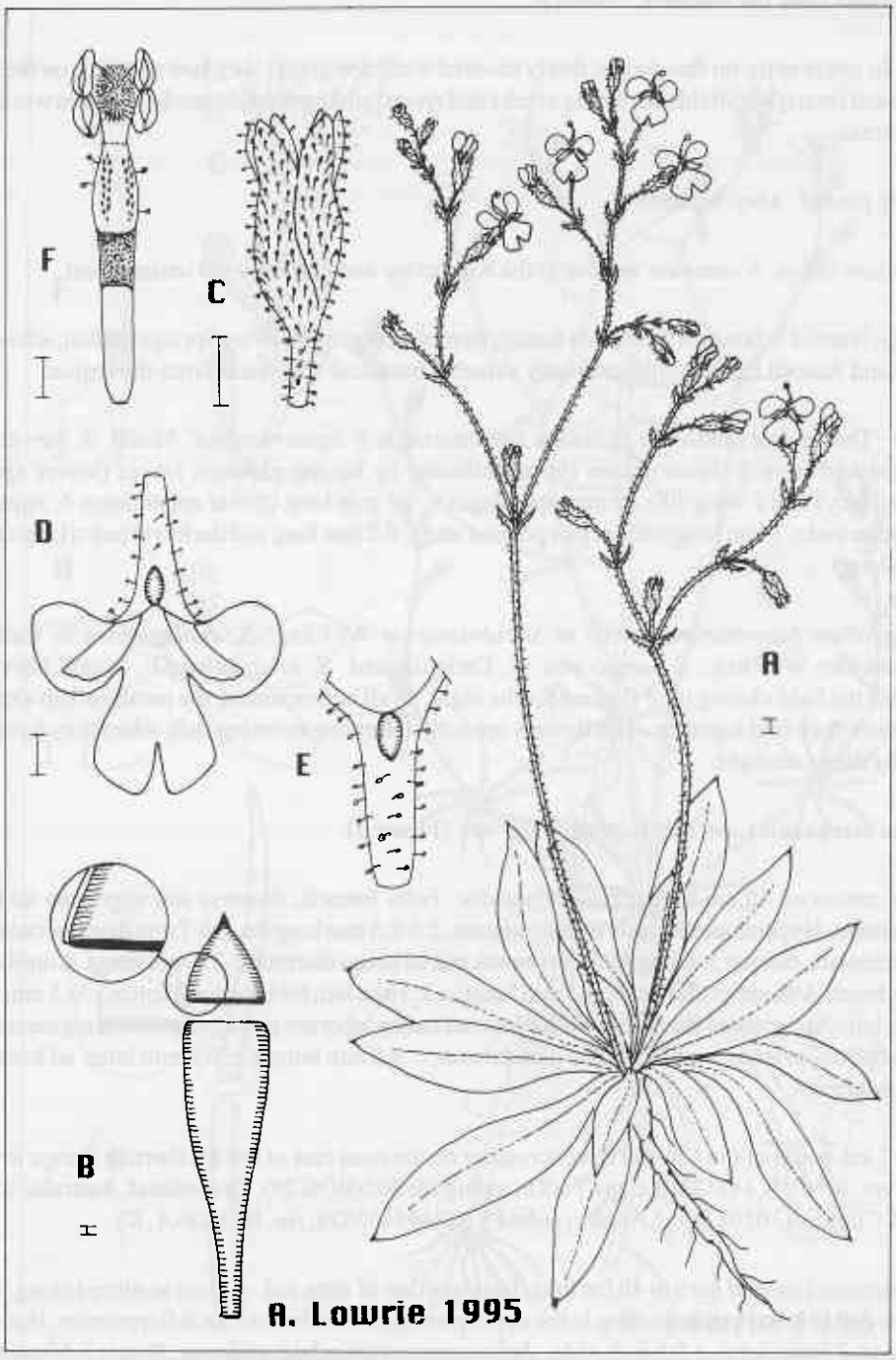

Figure 2. *Stylidium barrettorum* A - habit of flowering plant; B - leaf of basal rosette, enlarged section upper left; C - hypanthium and sepals; D - corolla; E - enlarged section of the corolla tube showing labellum on sinus; F - adaxial view of gynostemium column and stigma showing hinged portion (dotted) immediately below stigma, the dilated cunabulum with marginal papillae and the sensitive torosus (stippled). Scale bar for all = 1 mm.

Distribution. Occurs in northern parts of the Kimberley region of Western Australia. There are no records to date from the Northern Territory.

Habitat. In sandy soils, on floodways, thinly covered with cane grass (*Sorghum* species); on the banks of creeks and rivers; herbfields bordering creeks and rivers; amongst sandstone boulders in wet season seepage areas.

Flowering period. May-September.

Conservation status. A common species in the Kimberley and currently not under threat.

Etymology. Named in honor of the Barrett family, former owners of Beverley Springs Station, whose sons Matthew and Russell Barrett collected many valuable botanical specimens from the region.

Affinities. The nearest relative to *Stylidium barrettorum* is *S. leptorrhizum* F. Muell. *S. barrettorum* is distinguished from *S. leptorrhizum* (in parentheses) by having glabrous leaves (leaves sparsely glandular-hairy) and 2 wing-like throat appendages c. 1.3 mm long (throat appendages 6, upper pair terete-falcate and *c.* 1 mm long, central pair pointed and *c.* 0.2 mm long and the lower pair triangular and *c.* 0.3 mm long).

Notes. Stylidium barrettorum as well as *S. rubriscapum* W. Fitzg., *S. dunlopianum* S. Carlquist, *S. claytonioides* W. Fitzg., *S. longicornu* S. Carlquist and *S. schizanthum* F. Muell. have been observed in the field closing their flowers for the night. Well before sunset, the petals roll up along the length before they fold together. The flowers open the following morning only when they have been warmed by direct sunlight.

Stylidium clarksonii Lowrie & Kenneally, *sp. nov.* (Figure 3)

Herba annua ad 40 cm longa, caulis flaccidis. Folia linearia, dispersa sed aggregata ad basim inflorescentiae. Hypanthium anguste oblanceolatum, 2.5-3.5 mm longum, *c.* 0.7 mm diam. per anthesin. Sepala lanceolata, duo per 3/4 longitudinis connata, tria ad basim discreta, 2-2.5 mm longa. Corollae lobi lateraliter binati; lobi antici obovati, *c.* 4.5 mm longi, *c.* 2.5 mm lati; lobi postici elliptici, *c.* 5.5 mm longi, *c.* 2.5 mm lati. Appendices faucis 2, tumuloideae, ad basim loborum posticum prope marginem faucis positi. Labellum ovatum; umbo margine glandulosus, *c.* 0.6 mm longus, *c.* 0.4 mm latus, ad basim sini corolla-tubi affixus.

Typus: 4.7 km south of the Chester River crossing on the road east of the McIlwraith Range towards Nesbit River, 13°41'S, 143°28'E, Cape York mapping site 802 (ROK 29), Queensland, Australia, 21 June 1993, *J.R. Clarkson* 10108 & *V.J. Nelder* (*holo*: PERTH 04453026; *iso:* BRI, DNA, K).

Lax-stemmed *annual herb* to 40 cm long, basal portion of stem red. *Leaves* scattered along the lax stem, crowded a little when branching in the upper parts and at the base of an inflorescence, linear, flat in section, 10-25 mm long, *c.* 0.6 mm wide. *Inflorescence* paniculate, glabrous. *Bracts* 2-10 mm long. *Hypanthium* narrowly oblanceolate, 2.5-3.5 mm long, *c.* 0.7 mm diam. at anthesis, glandular. *Sepals* lanceolate, 2 fused for three quarters of their length, 3 free to the base, 2-2.5 mm long. *Corolla* predominantly dull red, lobes laterally paired, abaxial surface greenish cream, glandular; anterior lobes obovate, *c.* 4.5 mm long, *c.* 2.5 mm wide; posterior lobes elliptic, *c.* 5.5 mm long, *c.* 2.5 mm wide. *Throat* yellow with dark red blotches near the petal bases; throat appendages 2, mound-like at the base of the

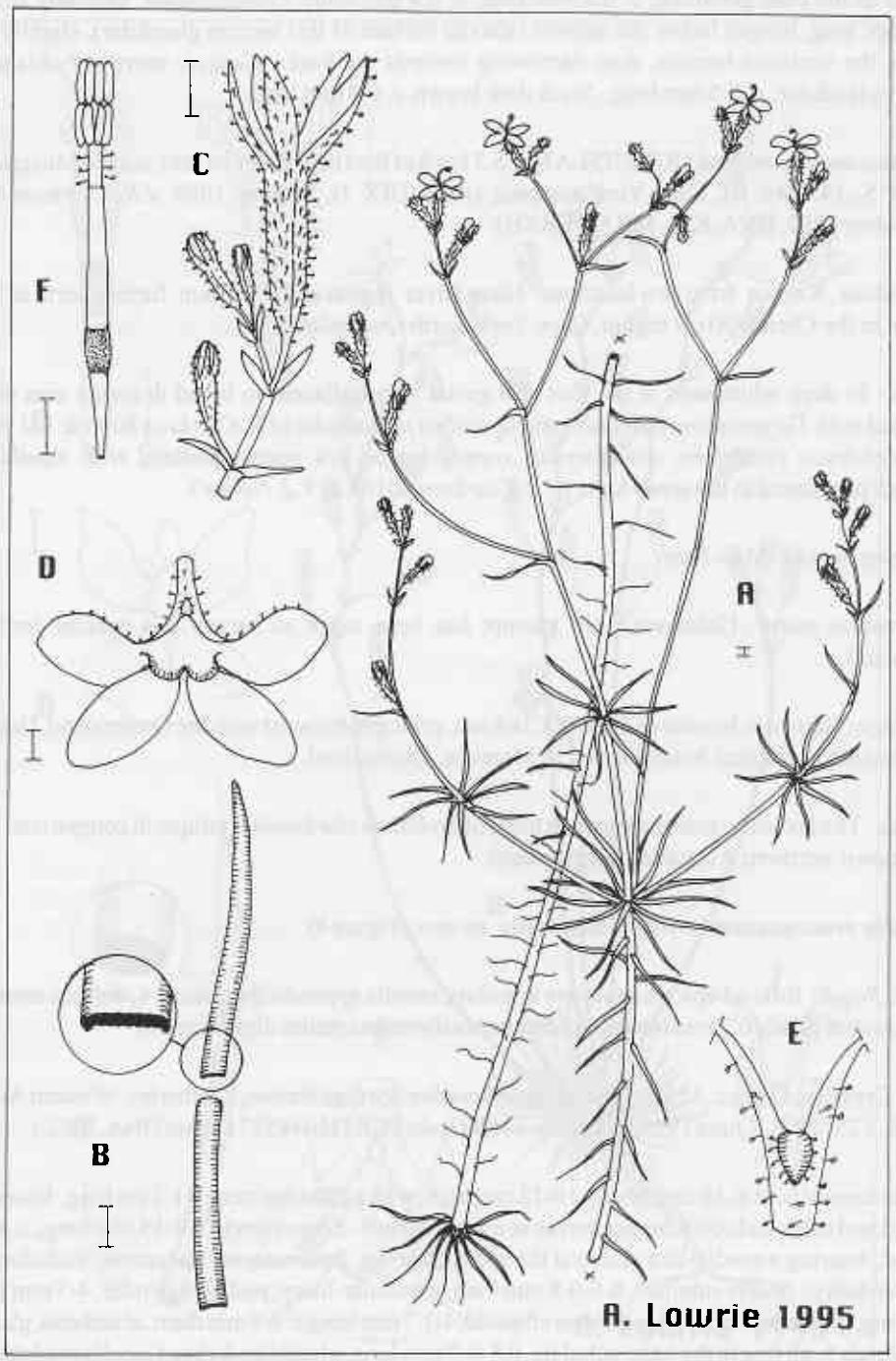

Figure 3. *Stylidium clarksonii* A - habit of flowering plant; B - leaf, enlarged section left; C - portion of an inflorescence showing mature hypanthium with three free sepals and the fusion of two sepals for three quarters of their length; D - corolla; E - enlarged section of the corolla tube showing labellum on sinus; F - adaxial view of gynostemium column and anthers showing hinged portion (dotted) immediately below anthers (the abaxial surface of this section glandular) and the sensitive torosus (stippled). Scale bar for all = 1 mm.

posterior lobes near the rim of the throat. *Labellum* attached to the base of the corolla tube sinus,ovate, margins of the boss glandular, *c.* 0.6 mm long, *c.* 0.4 mm wide. *Gynostemium* narrowly strap-like, *c.* 7.5 mm long, hinged below the anthers (abaxial surface of this section glandular), slightly dilated towards the sensitive torosus, then narrowing towards the base. *Capsule* narrowly oblanceolate, sparsely glandular, *c.* 5.5 mm long. *Seeds* dark brown, *c.* 0.4 mm long.

Other specimen examined. QUEENSLAND: 5.2 km S of the Hann River on the Laura to Musgrave road (15° 13' S, 143° 44' E), Cape York mapping site 8 (DIX 7), 31 May 1989, *J.R. Clarkson* 8006 & *V.J. Neldner* (BRI, DNA, K, L, MBA, PERTH).

Distribution. Known from two locations: Hann River region and *c.* 170 km further north at the type location in the Chester River region, Cape York, north Queensland.

Habitat. In deep white sand at the foot of a gentle slope adjacent to broad drainage area with low woodland with *Thryptomene oligandra* and *Grevillea pteridifolia* (*J.R. Clarkson* 8006 & *V.J. Nelder*); With *Melaleuca viridiflora*, *Asteromyrtus symphyocarpa* low open woodland with *Xanthorrhoea johnsonii* prominent in the scrub layer (*J.R. Clarkson* 10108 & *V.J. Nelder*).

Flowering period. May-June.

Conservation status. Unknown. No attempt has been made to survey this species from north Queensland.

Etymology. Named in honour of John R. Clarkson, principal botanist with the Queensland Herbarium and specialist in tropical botany based in Mareeba, Queensland.

Affinities. The lax leafy-stemmed growth habit of *Stylidium clarksonii* is unique in comparison with all other known northern Australian triggerplants.

Stylidium mucronatum Lowrie & Kenneally, *sp. nov.* (Figure 4)

A *S. floodii* folio ad apicem mucrone aciculari, corolla appendicibus faucis 4, duobus teretibus ad apicem leviter dilatis 0.7 mm longis, duobus tumoriformibus statim dignoscendo.

Typus: Grevillea Creek *c.* 35 km north-west of Beverley Springs Station, Kimberley, Western Australia, 16° 33' S, 125° 10' E, 7 June 1995, *A. Lowrie* 1188 (*holo*: PERTH 04452712; *iso*: DNA, MEL).

Erect *annual herb* 8-16 cm (mostly 10-12 cm) high, with a glabrous stem 1-1.5 cm long, lower leaves scattered and often caducous, upper leaves in a terminal tuft. *Leaves* terete, 10-15 mm long, *c.* 0.6 mm diameter, bearing a needle-like mucro at the apex, glabrous. *Inflorescence* racemose, including scape glandular-hairy. *Bracts* subulate, 0.6-0.8 mm long, glandular-hairy; pedicels slender, 4-7 mm (mostly 5 mm) long, glandular-hairy. *Hypanthium* ellipsoid, 1-1.7 mm long, *c.* 0.9 mm diam. at anthesis, glandular-hairy. *Sepals* 5, all free to the base, subulate, 0.6-0.9 mm long, glandular-hairy. *Corolla* predominantly pink with anterior lobe tips red, lobes vertically paired, abaxial surface yellow with red midvein, glandular; anterior lobes obovate-oblanceolate, *c.* 2.5 mm long, *c.* 1.5 mm wide; posterior lobes obovate, apex emarginate, *c.* 3 mm long, *c.* 2.5 mm wide. *Throat appendages* 4; upper pair terete with the apex slightly dilated, papillose, *c.* 0.7 mm long; lower pair small, round and bump-like, papillose. *Labellum* attached to the base of the corolla tube sinus, triangular, *c.* 0.3 mm long, *c.* 0.2 mm wide. *Gynostemium*, *c.* 5.2 mm

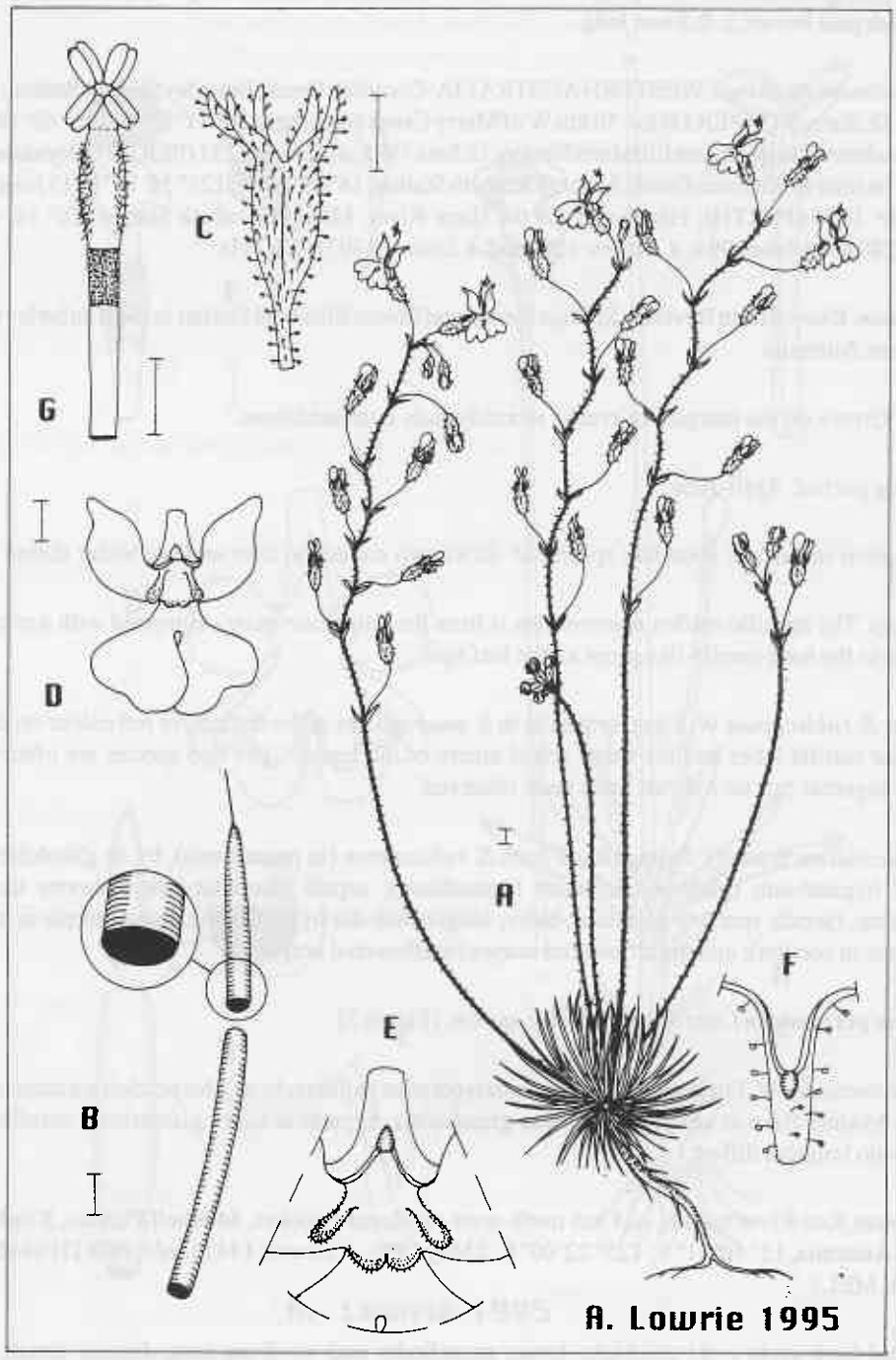

Figure 4. *Stylidium mucronatum* A - habit of flowering plant; B - leaf of basal tuft, enlarged section upper left; C - hypanthium and sepals; D - corolla; E - enlarged section of the corolla showing throat appendages; F - enlarged section of the corolla tube showing labellum on sinus; G - adaxial view of gynostemium column and anthers showing hinged portion (dotted) immediately below anthers, the dilated cunabulum with marginal brush-like rows of short, non-glandular hair-like projections and the sensitive torosus (stippled). Scale bar for all = 1 mm.

long, hinged below the anthers, with a dilated cunabulum bearing 2 crowded marginal brush-like rows of short, non-glandular hair-like projections above the sensitive torosus. *Capsule* obovoid, 2-2.5 mm long. *Seeds* pale brown, *c.* 0.2 mm long.

Other specimens examined. WESTERN AUSTRALIA: Coolabah Creek, Beverley Springs Station, 6 June 1992, *M.D. Barrett* 19 (PERTH); *c.* 50 km W of Merry Creek crossing at 16° 11' 52" S, 126° 02' 19" E on road to Bachsten Creek, Mount Elizabeth Station, 12 June 1995, *A. Lowrie* 1251 (PERTH); Drysdale River crossing on road to Bachsten Creek, Mount Elizabeth Station, 16° 09' 08" S, 125° 58' 16" E, 13 June 1995, *A. Lowrie* 1266 (PERTH); Headwaters of the Hann River, Mount Elizabeth Station, 16° 16' 48" S, 126° 06' 28" E, 14 June 1995, *A. Lowrie* 1299 and *A. Lowrie* 1307 (PERTH).

Distribution. Known from Beverley Springs Station and Mount Elizabeth Station in the Kimberley region of Western Australia.

Habitat. Grows on the margins of creeks in sandy soils over sandstone.

Flowering period. April-June.

Conservation status. An abundant species at its known collection sites and not under threat.

Etymology. The specific epithet *mucronatum* is from the latin *mucronate* - equipped with a mucro, in reference to the hard needle-like point at the leaf tips.

Affinities. S. rubiscapum W. Fitzg. is similar to *S. mucronatum* in the distinctive red colour on the tips of anterior corolla lobes and the sharp apical mucro of the leaves. The two species are often found growing together but no hybrids have been observed.

S. muconatum is easily distinguished from *S. rubiscapum* (in parenthesis), by its glandular-hairy ellipsoid hypanthium (glabrous turbinate hypanthium); sepals glandular-hairy, shorter than the hypanthium, (sepals sparsely glandular-hairy, longer than the hypanthium); leaves terete in section (lenticulate in section); and multiflowered scapes (uniflowered scapes).

Stylidium perizostera Lowrie & Kenneally, *sp. nov.* (Figure 5)

S. claytonioides W. Fitzg. affini sed lobis anticis corollae pallido rubris, lobis posticis aurantiacis zona interiore hyalina flava et alba, scapis sparse glandulosis, hypanthio supra glanduloso, corollae tubo sepalo 2-plo longiore differt.

Typus: Near Roe River mouth, *c.* 4 km north-west of Mount Brookes, Mitchell Plateau, Kimberley, Western Australia, 15° 10' 51" S, 125° 22' 00" E, 2 May 1996, *A. Lowrie* 1442 (*holo*: PERTH 04452771; *iso*: DNA, MEL).

Annual herb up to *c.* 11 cm high, lower stem fleshy and *c.* 2 cm long. *Leaves* terete, up to *c.* 7.5 mm long, with a short blunt apical mucro, glabrous. *Inflorescence* of few to many uniflowered scapes arising from the group of leaves on the upper stem, scape sparsely glandular. *Hypanthium* linear, continuous with the scape, *c.* 27 mm long, *c.* 0.7 mm diam. at anthesis, sparsely glandular only in the upper portion. *Sepals* fused together to form 2 lobes, marginally glandular, otherwise glabrous, *c.* 1.5 mm long. *Corolla* lobes vertically paired; anterior lobes pale red, broadly obovate, apex emarginate,

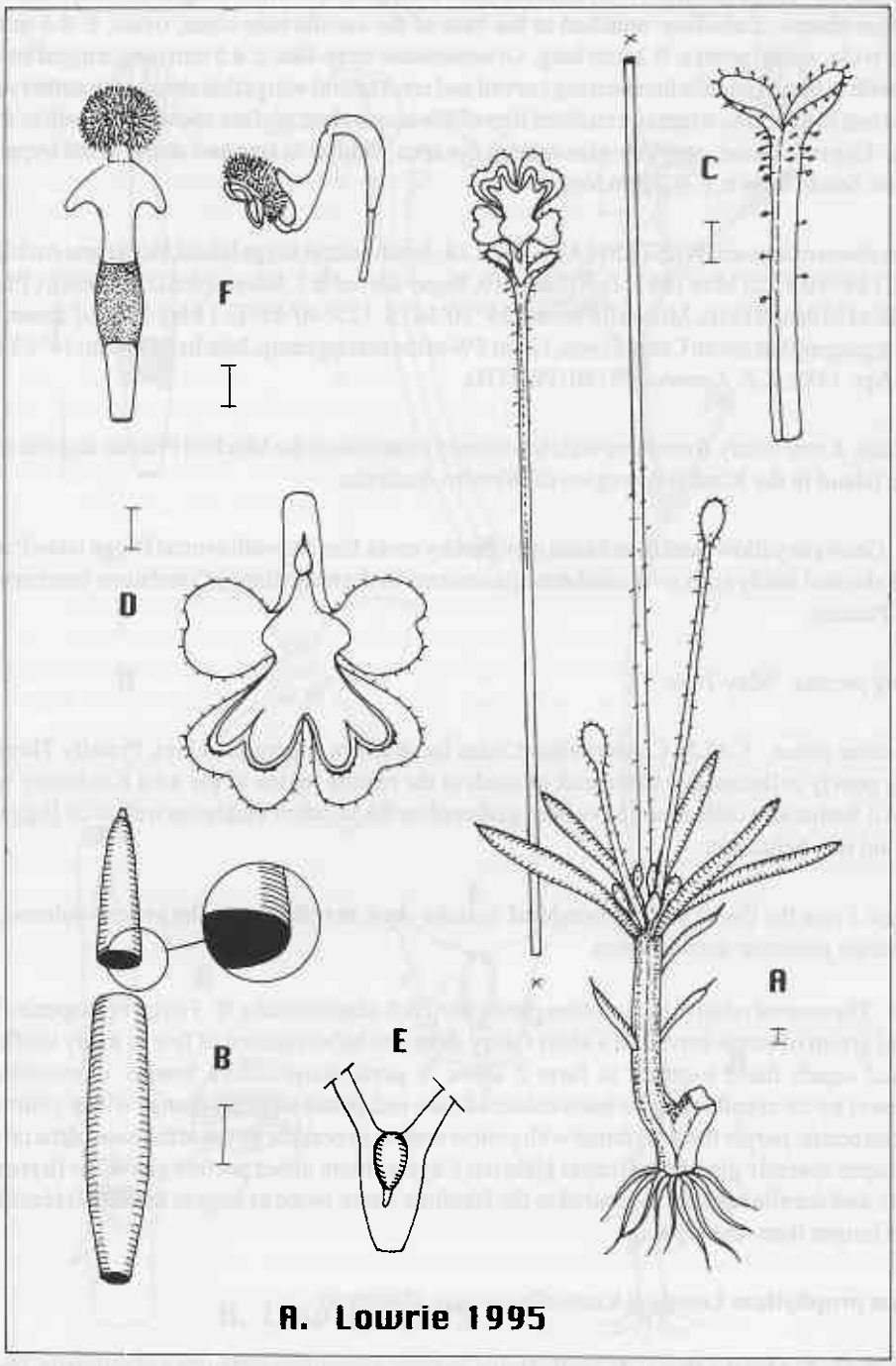

Figure 5. *Stylidium perizostera* A - habit of flowering plant; B - leaf, enlarged section upper right; C - hypanthium with sepals fused into two lobes; D - corolla; E - enlarged section of the corolla tube showing labellum on sinus; F - left, adaxial view of gynostemium column and stigma showing hinged portion (dotted) immediately below stigma, the dilated cunabulum bearing curved and erect lateral wings and the sensitive torosus (stippled); right, lateral view in the set position. Scale bar for all = 1 mm.

c. 3.5 mm long, *c.* 2.5 mm wide; posterior lobes with a narrow white zone separating the yellow basal portion from the orange distal portion, cuneate, apex emarginate, *c.* 6 mm long, *c.* 3.5 mm wide. *Throat appendages* absent. *Labellum* attached to the base of the corolla tube sinus, ovate, *c.* 0.6 mm long, *c.* 0.3 mm wide, apical point *c.* 0.2 mm long. *Gynostemium* strap-like, *c.* 8.5 mm long, hinged below the anthers, with a dilated cunabulum bearing curved and erect lateral wings that shroud the anthers as well as act as a rest to keep the stigmatic cushion free of the cunabulum surface above the sensitive torosus, glabrous. *Capsule* linear, sparsely glandular at the apex, similar in size and shape to the hypanthium at anthesis. *Seeds* brown, *c.* 0.2 mm long.

Other specimens examined. WESTERN AUSTRALIA: South central Bigge Island, Bonaparte Archipelago, 14° 34' S, 125° 10' E, 25 May 1991, *T. Willing* 410, *Roger Shivas & I. Riley* (spirit collection), (PERTH); *c.* 4 km SE of Mitchell Falls, Mitchell Plateau, 14° 50' 14" S, 125° 40' 45" E, 1 May 1996, *A. Lowrie* 1423 (PERTH); gauging station on Camp Creek, 12 km SW of the mining camp, Mitchell Plateau, 14° 53' S, 125° 45' E, 30 Apr. 1982, *K.F. Kenneally* 8180 (PERTH).

Distribution. Known only from three widely scattered locations on the Mitchell Plateau and one location on Bigge Island in the Kimberley region of Western Australia.

Habitat. Grows in yellow sand over basalt along rocky creek line on south central Bigge Island; in beige coloured skeletal sandy soils over sandstone pavements in drainage lines of sandstone outcrops on the Mitchell Plateau.

Flowering period. May-June.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Three. This species is poorly collected due to the lack of roads in the remote region of the west Kimberley where it occurs. All herbarium collections have been gathered on the Mitchell Plateau as well as on Bigge Island with the aid of a helicopter.

Etymology. From the Greek *peri* - around and *zostera* - belt, in reference to the yellow-coloured apron on the orange posterior corolla lobes.

Affinities. The nearest relative to *Stylidium perizostera* is *S. claytonioides* W. Fitzg., both species having a terminal group of terete leaves on a short fleshy stem, the inflorescence of few to many uniflowered scapes and sepals fused together to form 2 lobes. *S. perizostera* differs from *S. claytonioides* (in parentheses) by its corolla anterior lobes coloured pale-red, posterior lobes orange with a yellow inner zone (lobes cerise, purple towards throat with yellow markings near the throat at the base of the prosterior lobes); scapes sparsely glandular (scapes glabrous); hypanthium upper portion glandular (hypanthium glabrous); and corolla tube, as measured to the labellum sinus, twice as long as the sepals (corolla tube one third longer than the sepals).

Stylidium prophyllum Lowrie & Kenneally, *sp. nov.* (Figure 6)

S. fissilobio F. Muell. affini sed corollae lobis integris, appendicibus faucis 4 et subulatis, labello ad basim sini tubi corollae affixo.

Typus: On the road to Bell Gorge, 2 km west of Silent Grove camping area, Western Australia, 17° 03' S, 125° 15' E, 5 June 1995, *A. Lowrie* 1180 *(holo*: PERTH 04452828; *iso*: DNA, MEL).

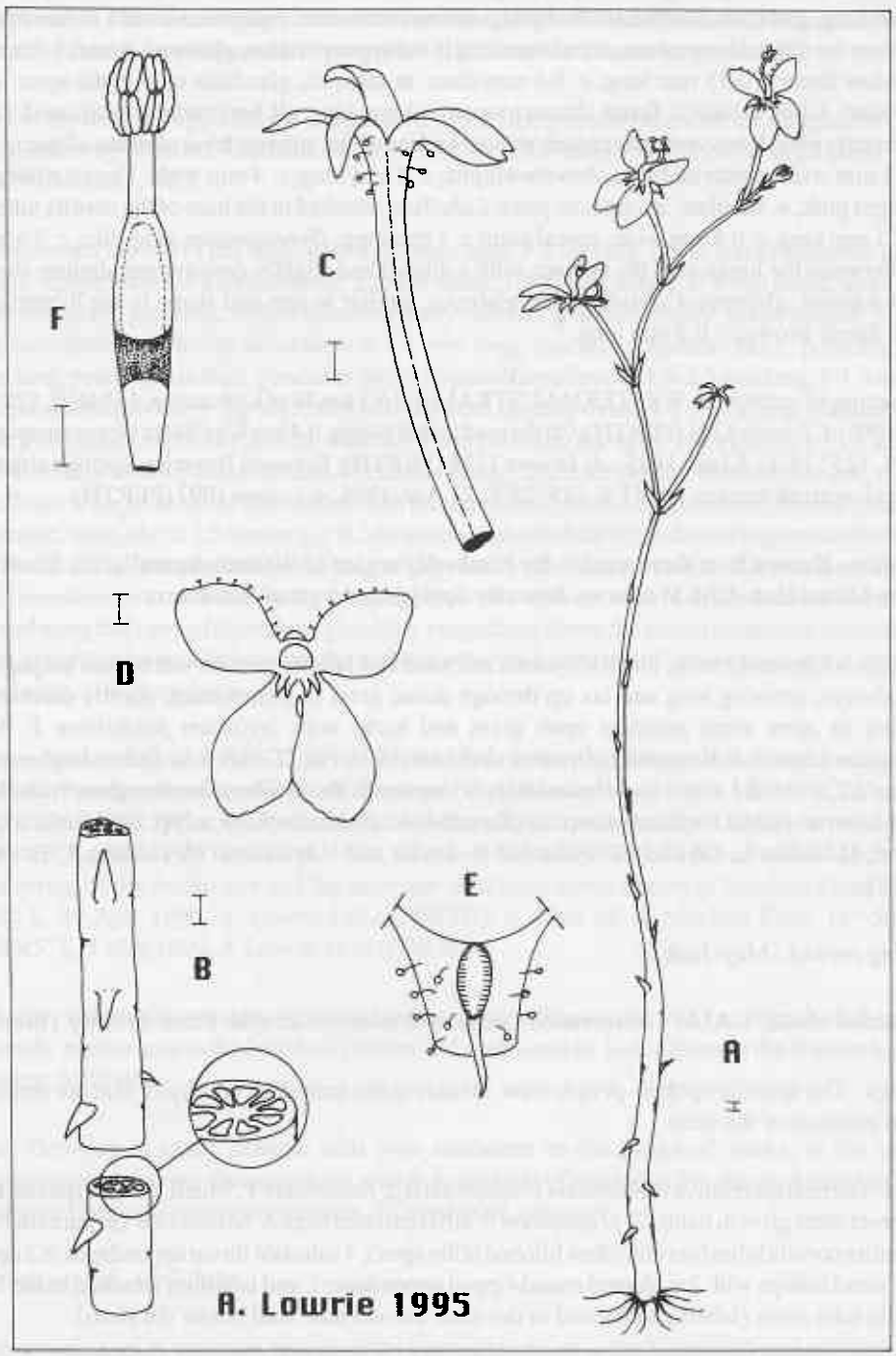

Figure 6. *Stylidium prophyllum* A - habit of flowering plant; B - lower portion of the stem showing the bract-like leaves and enlarged section right showing the irregular shaped internal longitudinal air cavities; C - hypanthium and horizontal sepals, with almost total fusion of two sepals; D - corolla; E - enlarged section of the corolla tuba showing labellum on sinus; F - adaxial view of gynostemium column and anthers showing hinged portion (dotted) immediately below the anthers, the dilated cunabulum and the sensitive torosus (stippled). Scale bar for all = 1 mm.

Annual herb to 30 cm high, taller specimens leaning on nearby herbs for support, lower portions of stem inflated, containing irregular-shaped longitudinal air cavities. *Leaves* few, scale-like, triangular, to 1.5 mm long, glabrous, confined to the basal portions of the stem. *Inflorescence* of 1 or more racemes arising from the dilated lower stem, often branching in the upper portions, glabrous. *Bracts* 1-2 mm long. *Hypanthium* linear, 10-15 mm long, *c.* 0.6 mm diam. at anthesis, glandular only at the apex. *Sepals* oblanceolate, 3 free to base, 2 fused almost to apex *c.* 3 mm long, all horizontally positioned. *Corolla* predominantly pink, lobes vertically paired, abaxial surface white; anterior lobes obovate-elliptic, *c.* 6 mm long, *c.* 3 mm wide; posterior lobes obovate-elliptic, *c.* 8 mm long, *c.* 4 mm wide. *Throat* white; throat appendages pink, 4, subulate, in opposite pairs. *Labellum* attached to the base of the corolla tube sinus, ovate, *c.* 1 mm long, *c.* 0.4 mm wide, apical point *c.* 1 mm long. *Gynostemium* strap-like, *c.* 7 mm long, narrow between the hinge and the anthers, with a dilated and slightly concave cunabulum above the sensitive torosus, glabrous. *Capsule* linear, glabrous, similar in size and shape to the hypanthium at anthesis. *Seeds* brown, *c.* 0.2 mm long.

Other specimens examined. WESTERN AUSTRALIA: 16.1 km W of Kununurra, 15° 46' S, 128° 36' E, 18 Apr. 1996, *A. Lowrie* 1391 (PERTH); On the road to Bell Gorge, 0.4 km W of Silent Grove camping area, 17° 04' S, 125° 15' E, 5 June 1995, *A. Lowrie* 1178 (PERTH); Between Beverley Springs airstrip and homestead on creek margin, 16° 43' S, 125° 28' E, 21 Apr. 1995, *A. Lowrie* 1092 (PERTH).

Distribution. Known from three areas in the Kimberley region of Western Australia: the Silent Grove region on Mount Hart CALM reserve, Beverley Springs and west of Kununurra.

Habitat. In white sandy soils, black silty soils and sand and laterite soils on wet season seepage areas and floodways, growing long and lax up through dense grass in wetter areas, shortly erect and self supporting in open areas amongst open grass and herbs with *Stylidium fissilobium* F. Muell., *S. costulatum* Lowrie & Kenneally, *Drosera derbyensis* Lowrie, *D. indica* L, *Byblis liniflora* subsp. *occidentalis* Conran & Lowrie and *Utricularia chrysantha* R. Br. in Silent Grove region; with *Drosera ordensis* Lowrie, *Byblis liniflora* subsp. *liniflora* Salisb., *Byblis liniflora* subsp. *occidentalis* Conran & Lowrie, *D. indica* L, *Utricularia tridactyla* P. Taylor and *Utricularia chrysantha* R. Br. west of Kununurra.

Flowering period. May-June.

Conservation status. CALM Conservation Codes of Western Australian Flora: Priority Three.

Etymology. The specific epithet - *prophyllum* alludes to the scale-like prophylls that are confined to the basal portions of the stem.

Affinities. The nearest relative to *Stylidium prophyllum* is *S. fissilobium* F. Muell, the two species having similar erect stem growth habit. *S. prophyllum* is differentiated from *S. fissilobium* (in parentheses) by having entire corolla lobes (corolla lobes bilobed at the apex); 4 subulate throat appendages in 2 opposite pairs (3 round bumps with 2 v-shaped round-tipped appendages); and labellum attached to the base of the corolla tube sinus (labellum attached to the outer corolla tube wall below the sinus).

Notes. The lower portions of the stem are inflated. In section, irregular-shaped internal longitudinal air cavities are revealed. This adaptation acts as a buoy-like floatation device to keep juvenile plants erect in shallow flooded habitats during the wet season.

Stylidium rivulosum Lowrie & Kenneally, *sp. nov.* (Figure 7)

A *S. floodii* F. Muell. lobis posticis corollae cuneatis, ad apicem emarginatis et 2/3 connatis, cunabulo gynostemii dilatato, fauci-appendicibus corollae 2, aliformibus 1.5 mm longis recedit.

Typus: On the road to Pago Mission (abandoned) from Honeymoon Beach on the margins of Unamon Creek, Kimberley, Western Australia, 14° 06' S 126° 43' E, 26 June 1994, *A. Lowrie* 1022 (*holo:* PERTH 04452879; *iso*: DNA, MEL).

Erect *annual herb* 7-14 cm high, with a glabrous stem 1-2 cm long, lower leaves scattered and often caducous, upper leaves in a terminal tuft. *Leaves* linear, 10-25 mm long, *c.* 0.8 mm diam., apex pointed but not mucronate, glabrous. *Inflorescence* of many racemes, glandular-hairy; scape slender, 5-10.5 cm long, glandular-hairy. *Bracts* subulate, 0.8-1.4 mm long, sparsely glandular-hairy; pedicels slender, 4-7 mm long, pendulous in fruit, glandular-hairy. *Hypanthium* obovoid, 1.5-2.5 mm long, 1-1.5 mm diam. at anthesis, glandular-hairy. *Sepals* 5, all free to the base, broadly ovate, 1-1.2 mm long, glandular-hairy. *Corolla* pink, lobes vertically paired; anterior lobes obovate, the apex emarginate, *c.* 3.5 mm long, *c.* 2.5 mm wide; posterior lobes cuneate, apex emarginate, fused for two thirds of their length, *c.* 4.5 mm long, *c.* 2 mm wide; abaxial surface yellow with maroon streaky blotches, glandular. *Throat appendages* 2, lanceolate, wing-like, *c.* 1.5 mm long, *c.* 0.3 mm wide, with small darker pink markings around the entrance to the throat. *Labellum* attached to the base of the corolla tube sinus, ovate, *c.* 0.6 mm long, *c.* 0.4 mm wide. *Gynostemium c.* 8.5 mm long, hinged below the anthers, with a dilated cunabulum bearing 2 crowded marginal rows of short, non-glandular projections above the sensitive torosus; abaxial surface sparsely glandular-hairy a little below the anthers, otherwise glabrous. *Capsule* obovoid, *c.* 4 mm long. *Seeds* orange, *c.* 0.2 mm long.

Other specimens examined. WESTERN AUSTRALIA: On the road to Pago Mission (abandoned) from Honeymoon Beach on the margins of Garlcarinangui Creek, Kimberley, 14° 08' S, 126° 43' E, 26 June 1994, *A. Lowrie* 1019 (PERTH); *c.* 0.5 km from start of Mitchell Falls walk trail from Little Merten's campsite at 14° 49' 10" S, 125° 43' 08" E, 29 Apr. 1996, *A. Lowrie* 1418 (PERTH); Tributary of the Mitchell River at the meeting of the freshwater and the saltwater tidal zone down stream of Mitchell Falls, 14° 40' S, 125° 38' E, 30 Apr. 1996, *A. Lowrie* 1422 (PERTH); *c.* 4 km SE of Mitchell Falls, 14° 50' 14" S, 125° 40' 45" E, 1 May 1996, *A. Lowrie* 1424 (PERTH).

Distribution. Known from widely separated locations over a distance of *c.* 295 km, from the Edkins Range in the south, northwards to the Mitchell Plateau and north-east to Kalumburu in the Kimberley region of Western Australia.

Habitat. Growing in sandy skeletal soils over sandstone on the banks of creeks; in the cracks of sandstone pavement along the margins as well as in the beds of creeks; and in sandy skeletal soils along the drainage lines and on the watersheds off sandstone outcrops.

Flowering period. April-July.

Conservation status. A common species at the known locations in the Kimberley and not under threat.

Etymology. The specific epithet *rivulosum* is from the Latin *rivulosus* - a streamlet, in reference to the habitat where this species occurs.

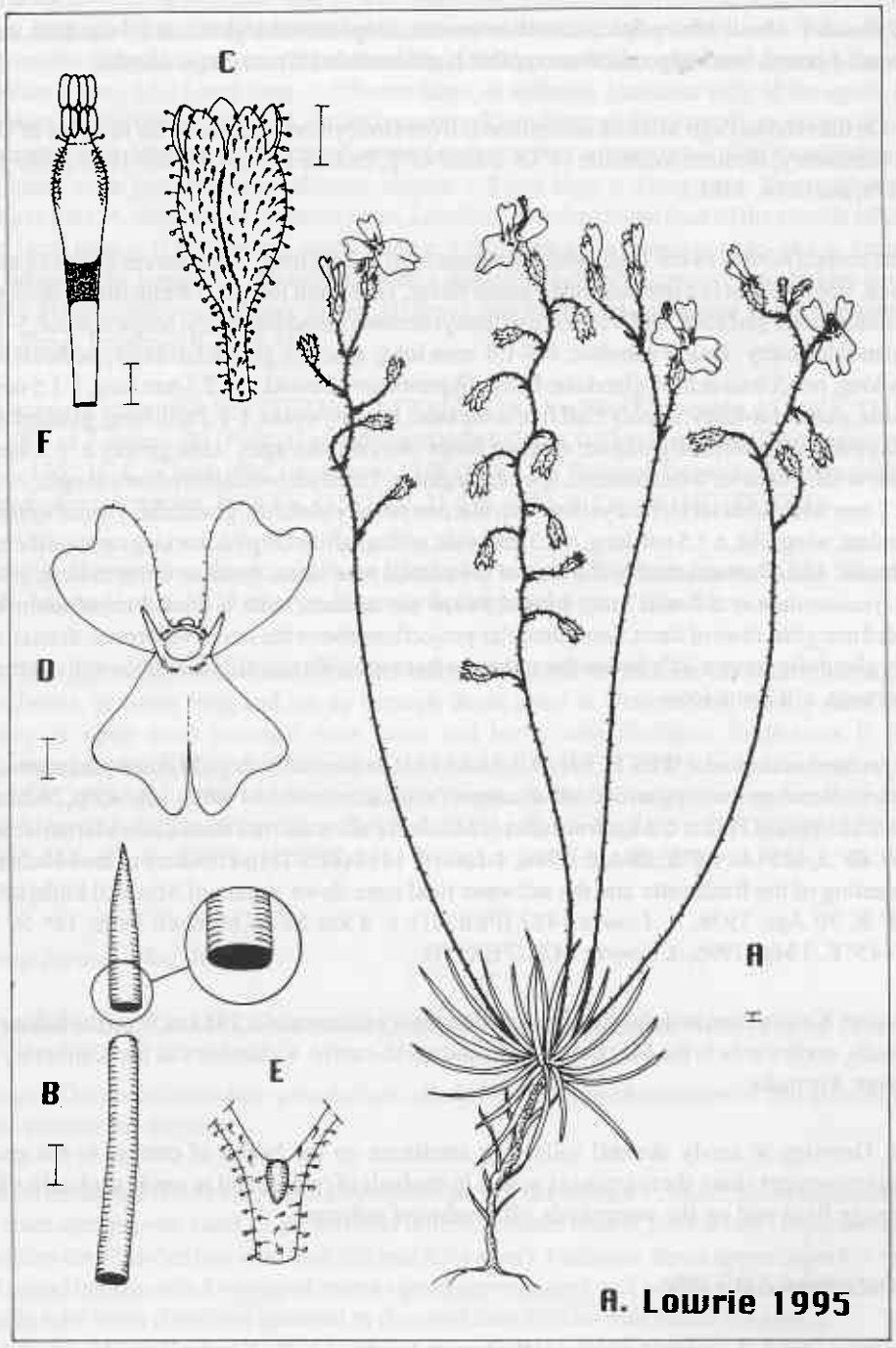

Figure 7. *Stylidium rivulosum* A - habit of flowering plant; B - leaf of basal tuft, enlarged section upper right; C - hypanthium and sepals; D - corolla; E - enlarged section of the corolla tube showing labellum on sinus; F - adaxial view of gynostemium column and anthers showing hinged portion (dotted) immediately below anthers, the dilated cunabulum with marginal papillae and the sensitive torosus (stippled). Scale bar for all = 1 mm.

Affinities. The nearest relatives to *Stylidium rivulosum* are S. *adenophorum, S. mucronatum, S. turbinatum* and *S. floodii* F. Muell. *S. rivulosum* and *S. floodii* are distinguished from *S. adenophorum, S. mucronatum* and *S. turbinatum* by having glabrous linear leaves with the apex pointed but not mucronate. *S. rivulosum* is distinguished from *S. floodii* (in parentheses) by having corolla throat appendages 2, lanceolate, wing-like, (throat appendages 5, crown-like); labellum *c.* 0.6 mm long, glabrous (labellum *c.* 0.4 mm long, glandular-hairy on margins and apex); gynostemium column *c.* 8.5 mm long, hinged below the anthers, with a dilated cunabulum bearing 2 crowded marginal rows of short, non-glandular projections above the sensitive torosus (gynostemium column strap-like, *c.* 5 mm long, narrowing towards the anthers from sensitive torosus).

Notes. The outline shape of the corolla lobes of this species is variable in the population at the type locality. The anterior lobes range from obovate with the apex of lobes emarginate to almost cuneate with the apex deeply emarginate. This character has been observed on occasion in other populations.

Stylidium turbinatum Lowrie & Kenneally, *sp. nov.* (Figure 8)

A *S. floodii* folio ad apicem mucrone parvo obtusoque, hypanthio turbinato in sectio pentagoniformi angulis manifeste verticaliter costatis, sepalis hypanthium superantibus, corolla appendicibus faucis sparse U-formatis, appendicibus duobus oppositis dentiformibus 0.3 mm longis, projectura labiacea revoluta inter appendices posita statim dignoscendo.

Typus: 1. 5 km east-south-east of the Elephant Rock end of the Sleeping Buddha hill formation south of Kununurra, Kimberley, Western Australia, 15° 50' S, 128° 46' E, 25 April 1995, *A. Lowrie* 1095 *(holo*: PERTH 04452925; *iso*: DNA, MEL).

Erect *annual herb* 6-15 cm (mostly 8-10 cm) high, with a glabrous stem 2-5 cm long, lower leaves scattered and often caducous, upper leaves in a terminal tuft. *Leaves* terete, 10-20 mm long, *c.* 0.7 mm diameter, with a small blunt mucro at the apex, glabrous. *Inflorescence* of many racemes, glandular-hairy; scape slender, 2-5 cm (mostly 2.5-3 cm) long, glandular-hairy. *Bracts* subulate, 1-2.5 mm long, sparsely glandular-hairy. *Pedicels* slender, 3-8 mm (mostly 6-8 mm) long, glandular-hairy. *Hypanthium* turbinate, pentagonal in section, the angles distinctly vertically ribbed, 1-2.3 mm long, *c.* 1 mm diam. at anthesis, glandular-hairy. *Sepals* 5, all free to the base, subulate, 1.2-1.5 mm long, glandular-hairy. *Corolla* pink, lobes vertically paired, abaxial surface a little glandular; anterior lobes obovate-oblanceolate, *c.* 2 mm long, *c.* 1.5 mm wide; posterior lobes obovate, apex emarginate, *c.* 3 mm long, *c.* 2.3 mm wide. *Throat appendages* forming a sparsely glandular U-shaped arrangement of 2 opposite *c.* 0.3 mm long tooth-like projections with a lip-like ledge rolled under between. *Labellum boss* attached to the base of the corolla tube sinus, ovate, smooth, convex, with a hyaline margin, *c.* 0.5 mm long, *c.* 0.25 mm wide. *Gynostemium c.* 7.7 mm long, hinged below the anthers, with a dilated cunabulum bearing 2 crowded marginal brush-like rows of short, non-glandular projections above the sensitive torosus; torosus adaxial surface scabrid, abaxial surface glabrous; margins and abaxial surface of anthers sparsely glandular-hairy. *Capsule* obovoid, 2.5-3 mm long. *Seeds* pale orange, *c.* 0.2 mm long.

Other specimens examined. NORTHERN TERRITORY: Howard Springs, 12° 27' S, 131° 03' E, 20 June 1990, *P. Simmons* 8 (PERTH); Howard Springs, 12° 27' S, 131° 03' E, 21 Apr. 1994, *A. Lowrie* 886 (PERTH); Paddy Rd, off Bridge Mary Rd, Koolpinyah, 12° 23' S, 131° 11' E, 29 Apr. 1995, *A. Lowrie* 1125 (PERTH); Noonamah, 12° 38' S, 131° 03' E, 24 July 1993, *D.E. Murfet* 1824 (PERTH); Noonamah, 12° 38' S, 131° 04' E, 24 Apr. 1994, *A. Lowrie* 939 (PERTH).
WESTERN AUSTRALIA: Pack Saddle Plains Rd, S of Kununurra, 15° 53' S, 128° 44' E, 18 June 1994, *A. Lowrie* 958 (PERTH); Cave Spring, N of Kununurra, 15° 34' S, 128° 48' E, 3 July 1994, *A. Lowrie* 1050 (PERTH).

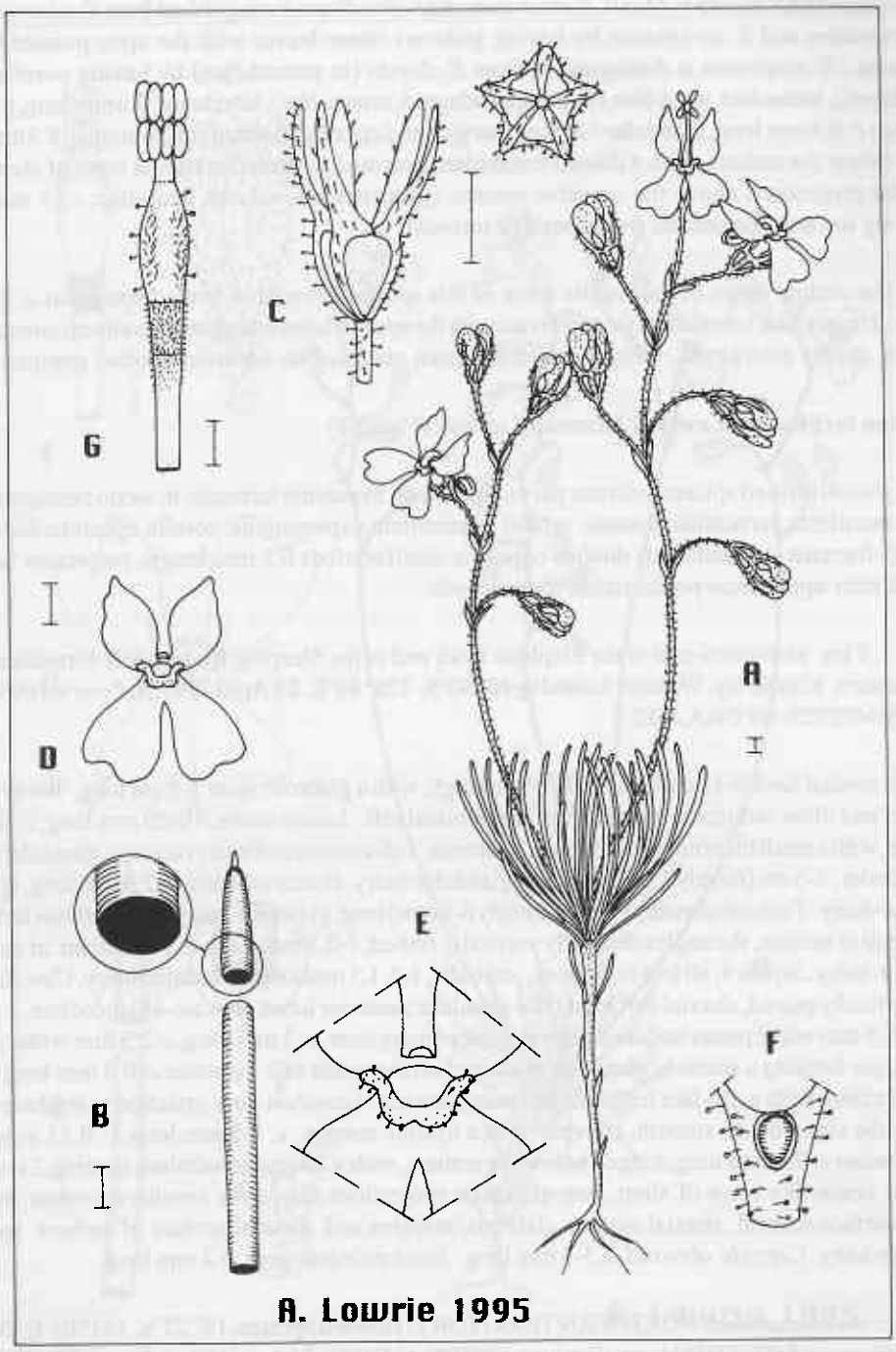

Figure 8. *Stylidium turbinatum* A - habit of flowering plant; B - leaf of basal tuft, enlarged section upper left; C - hypanthium and sepals left with base view of hypanthium right; D - corolla; E - enlarged section of the corolla showing throat appendages; F - enlarged section of the corolla tube showing labellum on sinus; G - adaxial view of gynostemium column and anthers showing hinged portion (dotted) immediately below anthers, the dilated cunabulum with marginal brush-like rows of short, non-glandular hair-like projections and the sensitive torosus with scabrid papillae. Scale bar for all = 1 mm.

Distribution. Occurs in the Northern Territory from Darwin southwards to Katherine. Found at scattered locations around Kununurra in the east Kimberley in Western Australia.

Habitat. Grows in sandy soils on the margins of creeks and floodways, watersheds and wet season herb fields.

Flowering period. June-July.

Conservation status. A common species in the Northern Territory and not under threat. Frequent around the Kununurra region and not under threat.

Etymology. The specific epithet *turbinatum* is from the latin *turbinatus* - obconical, in reference to the shape of the hypanthium.

Affinities. The hypanthium shape, corolla lobes outline, and throat appendages of *Stylidium turbinatum*, although smaller, are similar to those found in *S. rubiscapum* W. Fitzg. *S. turbinatum* can be distinguished from *S. rubiscapum* (in parentheses) by the lack of the distinctive red colour marking on the tips of anterior corolla lobes (anterior corolla lobes tipped red); leaves terete, round in section, terminating with a short blunt apical mucro (leaves linear, lenticulate in section, terminating with a sharp apical mucro); and multi-flowered scapes (uni-flowered scapes).

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